



ORACLE

Oracle Linux Management with Oracle Enterprise Manager

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INTRODUCTION

The Oracle Linux operating environment offers a complete, open DevOps environment for digital transformation that is designed for hybrid and multi-cloud deployments at scale. It delivers leading performance, scalability, and reliability for enterprise SaaS and PaaS workloads as well as traditional enterprise applications. It is the only Linux distribution with Ksplice zero-downtime, automated patching for kernel, hypervisor, and critical user space libraries. Oracle Linux Premier Support includes operating system, virtualization, cloud native computing tools, high availability clustering, management tools, and more. With simple, flexible and comprehensive support options, Oracle Linux helps reduce IT infrastructure cost.

Oracle Enterprise Manager 13c provides an integrated, simple and cost-effective solution for complete Oracle Linux server lifecycle management.

This paper will show how Oracle Enterprise Manager 13c enables the administrator to accomplish multiple Linux system management tasks securely from a single console.

ORACLE ENTERPRISE MANAGER 13C OVERVIEW

Oracle Enterprise Manager is Oracle's on-premises management platform that provides a single dashboard to manage all of your Oracle deployments, in your data center or in the cloud. Through deep integration with Oracle's product stack, it provides market-leading management and automation support for Oracle applications, databases, middleware, hardware, and engineered systems.

Oracle Enterprise Manager 13c key product capabilities include complete cloud lifecycle management, integrated cloud stack management, and business-driven application management. It also provides comprehensive Oracle Linux management capabilities.

Oracle Linux Support customers at the Basic and Premier support levels can use Oracle Enterprise Manager 13c to manage all their Oracle Linux installed servers at no additional license fee or support cost.

Oracle Enterprise Manager 13c enables administrators to:

- Discover assets within the data center and organize them in groups
- Monitor assets
- Provision Oracle Linux
- Manage Oracle Linux patching
- Manage systems compliance to enterprise rules
- Execute operational procedures on a group of servers or on individual servers

Oracle Enterprise Manager 13c easily integrates into an existing Linux patching and provisioning infrastructure because its Linux management is based on open Linux standards (yum patching, PXE boot provisioning). Oracle Linux version 8 support for management, patching and ksplice is enabled with Oracle Enterprise Manager 13c version 13.4 Release Update 4.

MANAGING ORACLE LINUX WITH ORACLE ENTERPRISE MANAGER 13C

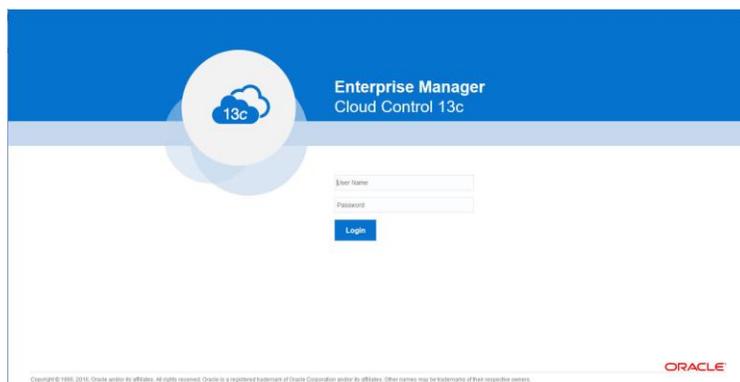


Figure 1. Oracle Enterprise Manager 13c login console

Discovery and Inventory

Oracle Enterprise Manager 13c launches periodic jobs that scan for unmanaged hosts via a network scan. The discovered hosts can then be promoted to “managed” status by installing and running the Oracle Enterprise Manager agent.

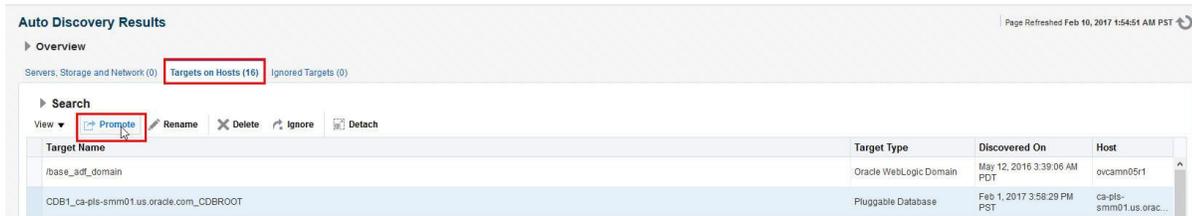


Figure 2. Promote discovered host

Groups

Three types of Groups can be created in Oracle Enterprise Manager:

- **Group:** Group members are pre-created based on target properties such as life cycle status or cost center. Members (hosts) have to be manually added to the group whenever a host is discovered through Enterprise Manager.
- **Dynamic Groups:** Similar to Group, however members (hosts) are automatically added based upon target properties.
- **Administrative Groups:** These groups enable the automatic application of monitoring and other management settings based upon the lifecycle status of the target. Lifecycle status options are:
 - Mission Critical (highest priority)
 - Production
 - Stage
 - Test
 - Development (lowest priority)

The creation of groups is a powerful method of placing hosts in an area of separation, which can be monitored and have actions applied to them as a group.

Oracle Linux Home

From Oracle Enterprise Manager 13c version 13.3, a new Oracle Linux Home target has been introduced; from Oracle Enterprise Manager 13c version 13.4 Release Update 4, Oracle Linux version 8 is supported within the Oracle Linux Home. View the Oracle Linux Home from the Cloud Menu via Enterprise > Cloud > Oracle Linux Home:

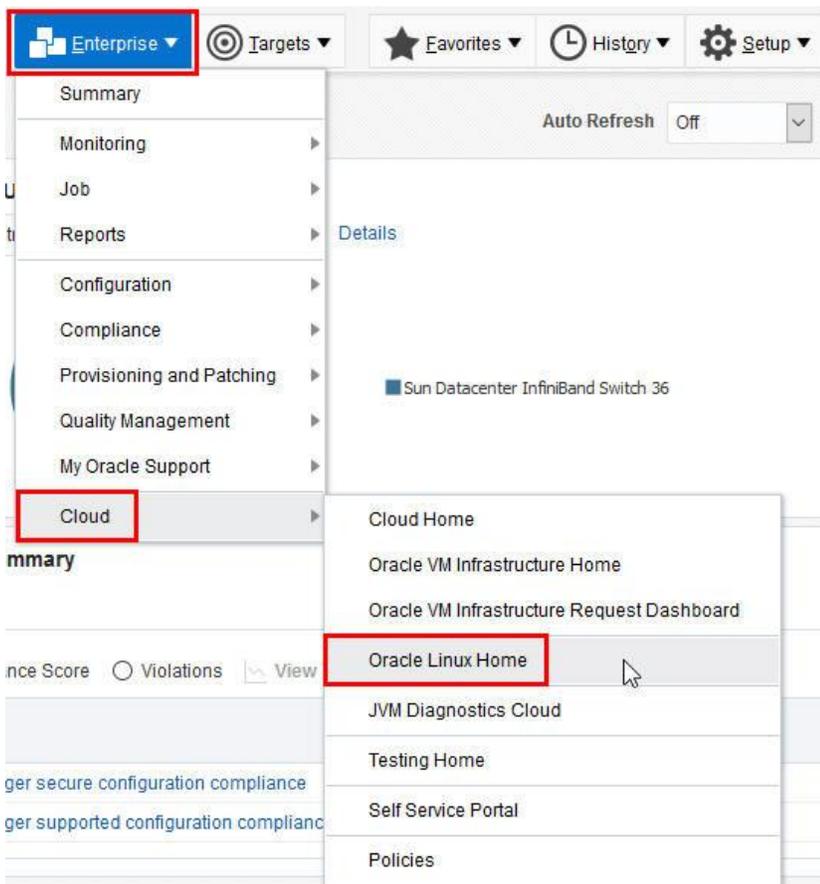


Figure 3. Menu flow to access Oracle Linux Home

This new home page, enables customers to perform management and monitoring of Oracle Linux hosts. Main features include:

- Oracle Linux host administration and management
- Bare Metal Provisioning (BMP)
- Oracle Linux OS patching
- Oracle Ksplice patching (provides the ability to update the Oracle Linux operating system kernel and key user space libraries while the OS is running, without a reboot or interruption. See Ref 4)
- Add a new Oracle Linux host which directs the user to the Setup > Add Target > Add Targets Manually wizard to push an Oracle Enterprise Manager agent to the Oracle Linux host

This new target is also visible from the All Targets view:

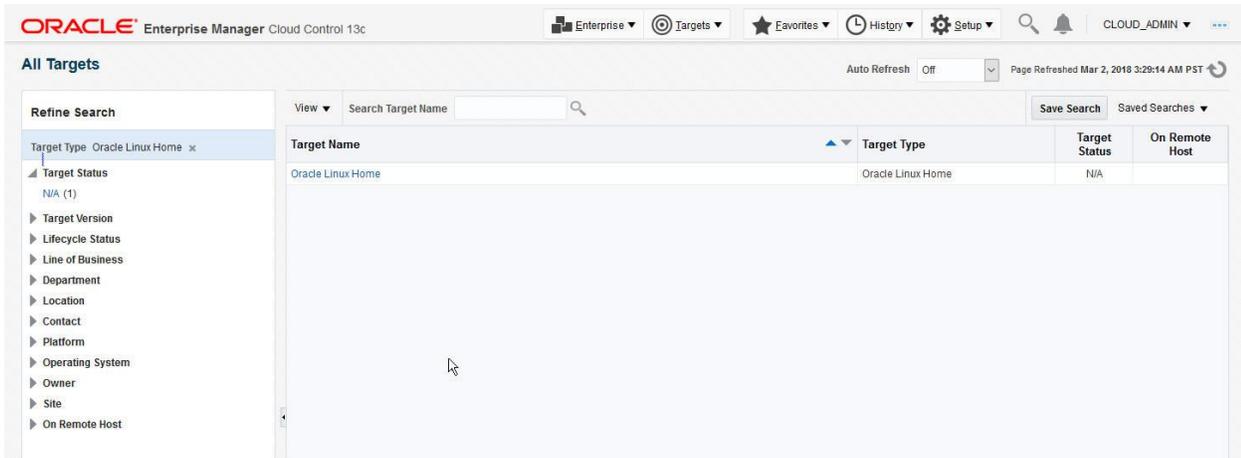


Figure 4. Oracle Linux Home from the All Targets view

Navigate to the Oracle Linux Home from either the Enterprise or All Targets page.

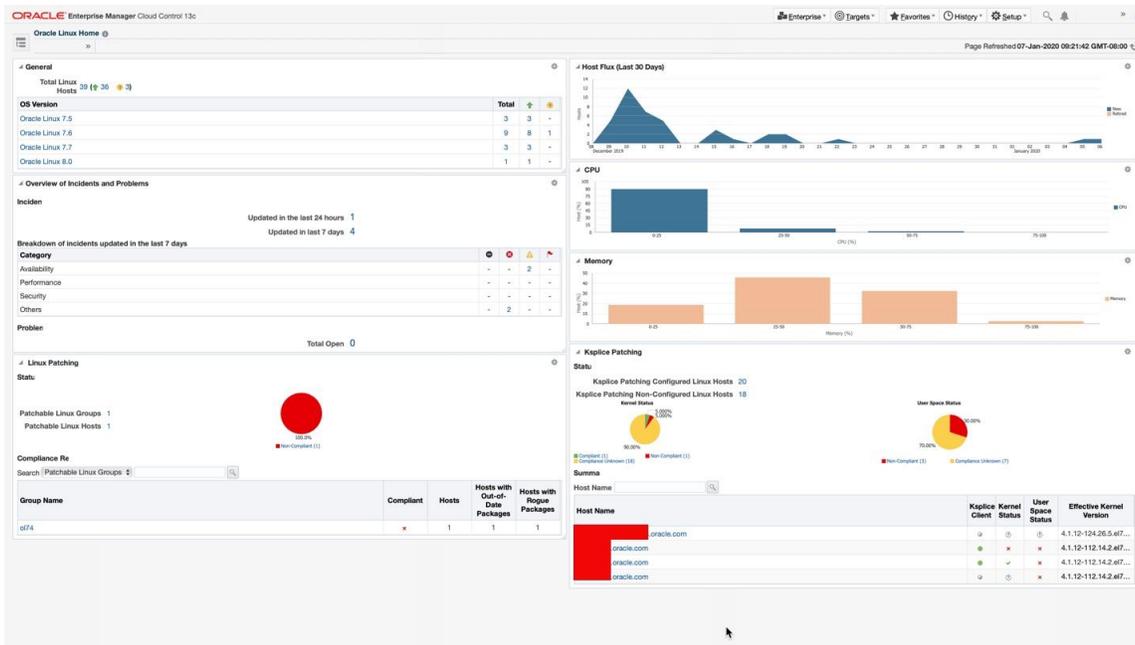


Figure 5. Oracle Linux Home

Oracle Linux Home has the following regions:

- General
- Overview of Incidents and Problems
- Host flux
- CPU
- Memory
- Linux patching compliance / summary
- Ksplice patching compliance / summary

General

The general region shows a summary of the Oracle Linux hosts showing total numbers of each Oracle Linux version as well as their status.

| OS Version | Total | Green | Yellow |
|------------------|-------|-------|--------|
| Oracle Linux 7.5 | 3 | 3 | - |
| Oracle Linux 7.6 | 9 | 8 | 1 |
| Oracle Linux 7.7 | 3 | 3 | - |
| Oracle Linux 8.0 | 1 | 1 | - |

Figure 6. Oracle Linux Home General Region

From here, click on the OS version, which will show a tabular view of all Oracle Linux hosts matching that version. A similar view can be seen by clicking on any of the total or green arrow links. This view displays useful information such as CPU and memory utilization and total IO/second. These metrics have links which when clicked will go to the metric monitoring area for that host. Here, other useful information such as logical memory, CPU load, network interface rate and swap utilization are available.

| Host Name | Status | OS Version | CPU Util % | Mem Util % | Total IO/sec | Longest IO (ms) | Logical Memory Free % | Logical Memory Used % | CPU Load (15 min) | CPU Load (5 min) | CPU IO Wait % | All Network Interfaces Write Rate (MB/sec) | All Network Interfaces Read Rate (MB/sec) | Swap Util % | Platform |
|-----------|--------|------------------|------------|------------|--------------|-----------------|-----------------------|-----------------------|-------------------|------------------|---------------|--|---|-------------|----------|
| ... | ... | Oracle Linux 7.5 | 0.8 | 46.89 | 4.14 | 0 | 51.92 | 46.89 | 0.02 | 0.01 | 0.04 | 0 | 0 | 0 | ORL_64 |
| ... | ... | Oracle Linux 7.5 | 0.02 | 48.21 | 3.76 | 0 | 11.69 | 48.21 | 0.02 | 0.02 | 0.02 | 0 | 0 | 0 | ORL_64 |
| ... | ... | Oracle Linux 7.5 | 0.07 | 43.96 | 2.85 | 0 | 16.54 | 43.96 | 0.02 | 0.01 | 0.06 | 0 | 0 | 0 | ORL_64 |
| ... | ... | Oracle Linux 7.5 | 0.78 | 47.23 | 3.31 | 0 | 52.77 | 47.23 | 0.02 | 0.02 | 0.31 | 0 | 0 | 0 | ORL_64 |
| ... | ... | Oracle Linux 7.5 | 1.01 | 16.36 | 3.91 | 0 | 94.65 | 16.36 | 0.02 | 0.02 | 0.02 | 0 | 0 | 0 | ORL_64 |

Figure 7. Oracle Linux Hosts

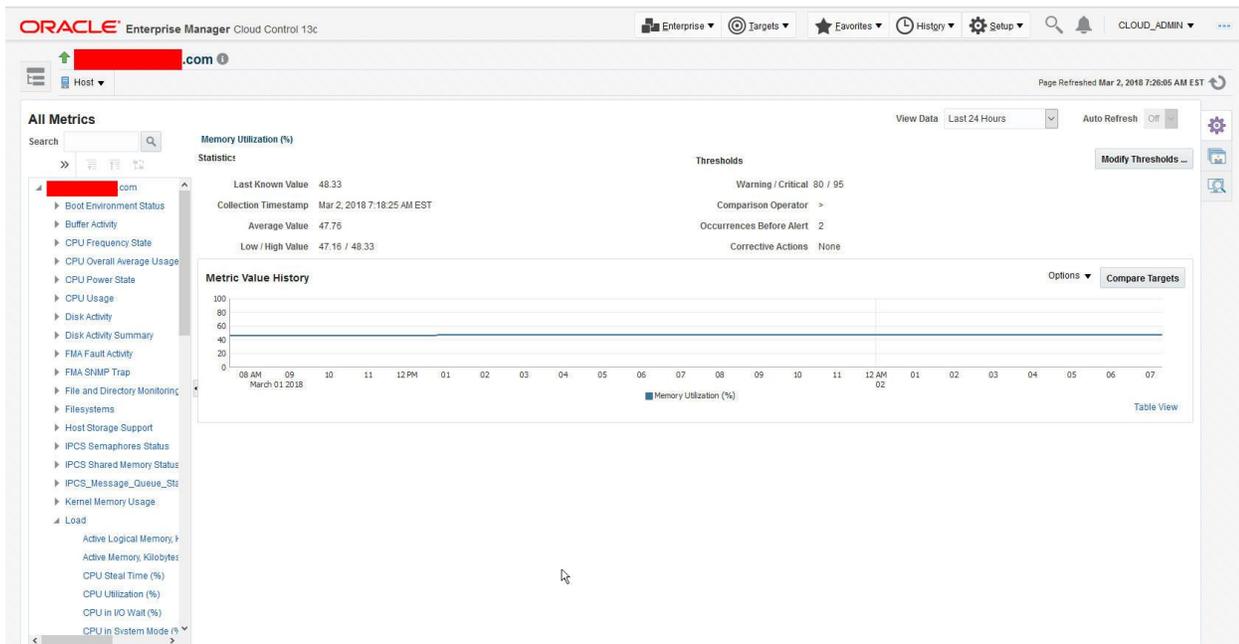


Figure 8. Oracle Linux Host Memory Utilization Metric

Overview of Incidents and Problems

From here, any incidents or problems affecting the Oracle Linux hosts with respect to availability, performance and security can be viewed.

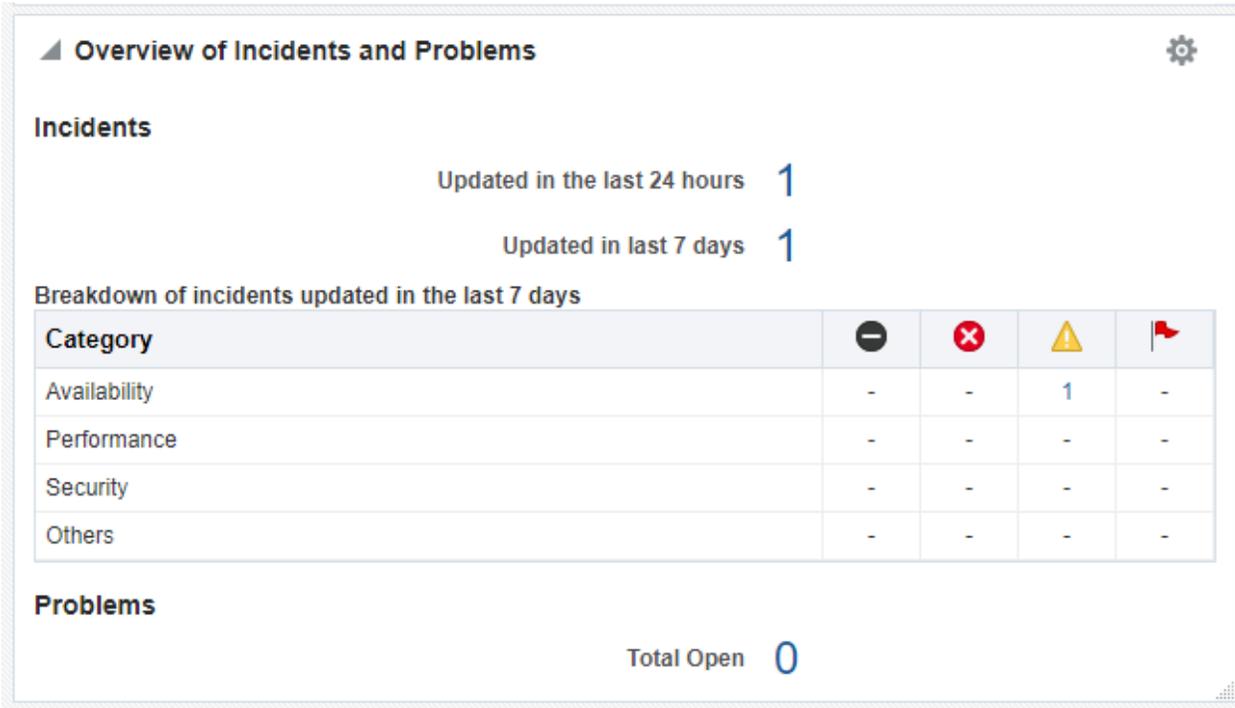


Figure 9. Incident and Problem overview

Host flux

When Oracle Linux hosts are retired or added, these events are tracked based on when they occurred over a period of the last 30 days.

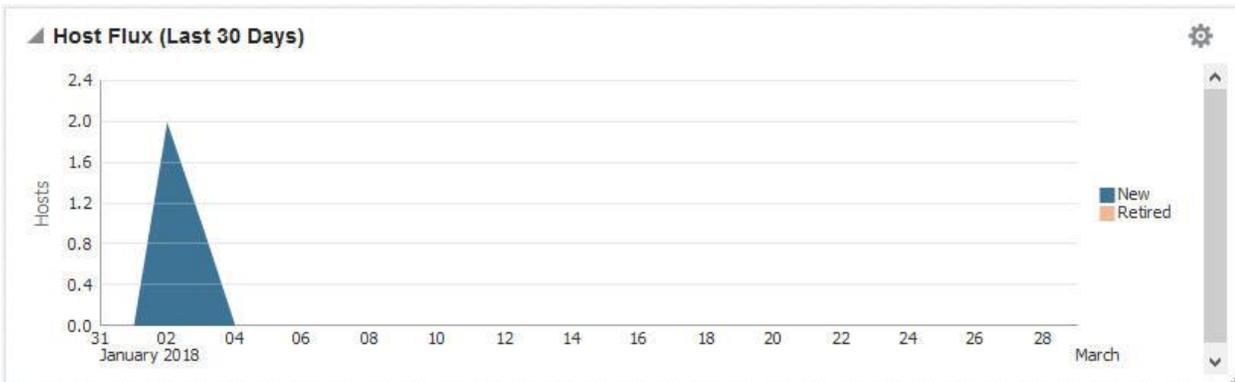


Figure 10. Host flux

CPU

Here, CPU utilization is displayed over a range of Oracle Linux hosts. In this example, there are 12 Oracle Linux hosts where 100% of them have a CPU utilization between 0 – 25%.

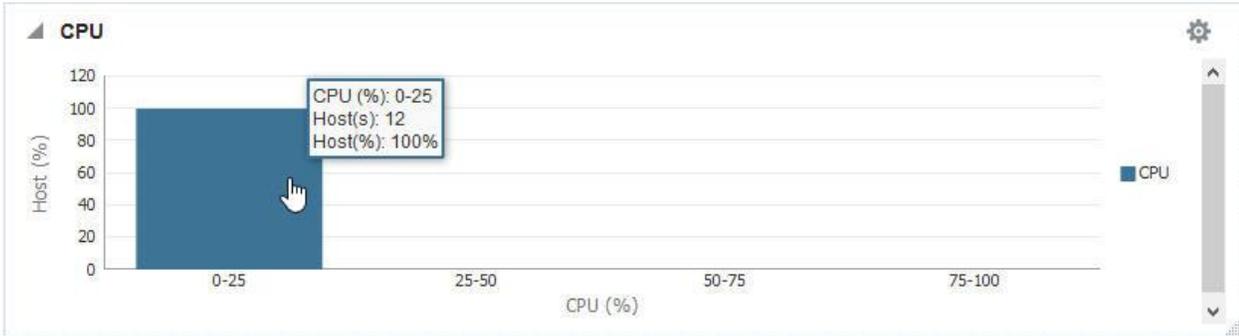


Figure 11. CPU

By clicking on the CPU 0-25 bar, a table view of each host with individual CPU utilization can be viewed.

| Host Name | CPU (%) |
|----------------|---------|
| [Redacted].com | 5.97 |
| [Redacted].com | 0.07 |
| [Redacted].com | 0.29 |
| [Redacted].com | 0.24 |
| [Redacted].com | 0.69 |
| [Redacted].com | 0.81 |
| [Redacted].com | 3.25 |
| [Redacted].com | 3.43 |
| [Redacted].com | 12.18 |
| [Redacted].com | 0.61 |
| [Redacted].com | 1.06 |

Figure 12. CPU breakdown

Memory

For memory, a similar approach to CPU is taken. This example shows 12 Oracle Linux hosts split with regard to their memory utilization.

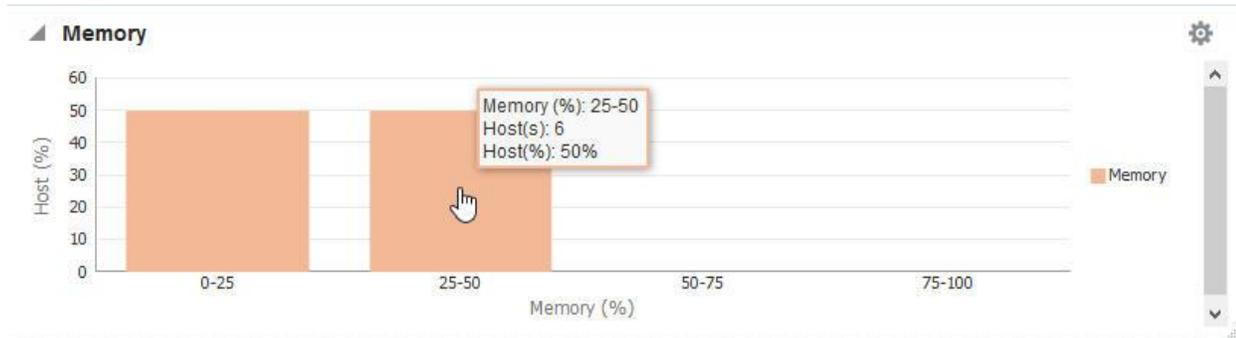


Figure 13. Memory view

Clicking on the memory 25-50 bar will show a table view of each host with individual memory utilization.

| Host(s): Memory 25-50% | |
|------------------------|------------|
| Host Name | Memory (%) |
| [REDACTED].com | 27.14 |
| [REDACTED].com | 38.74 |
| [REDACTED].com | 47.26 |
| [REDACTED].com | 43.98 |
| [REDACTED].com | 48.33 |
| [REDACTED].com | 46.89 |

Figure 14. Memory breakdown

Oracle Linux Patching Status / Compliance

Here, two regions are shown: Oracle Linux Status and Compliance.

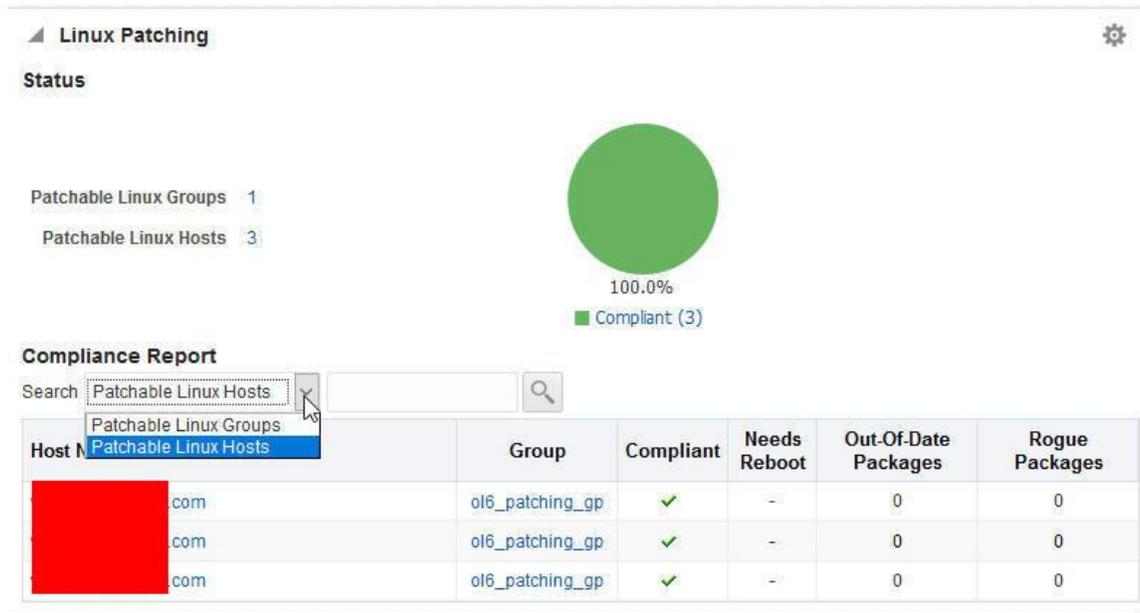


Figure 15. Oracle Linux patching compliant view

The status region shows how many Oracle Linux hosts are compliant with respect to Oracle Linux packages present on the Oracle Linux host, compared to packages within the Unbreakable Linux Network (ULN)-based or custom patching groups.

The Compliance Region view can be changed between Hosts or Patching groups. Both views show any hosts or patching groups that have out of date or rogue packages. A rogue package is one that exists on the Oracle Linux host but not in ULN-based or custom patching groups.

Figure 16 shows a non-compliant view.

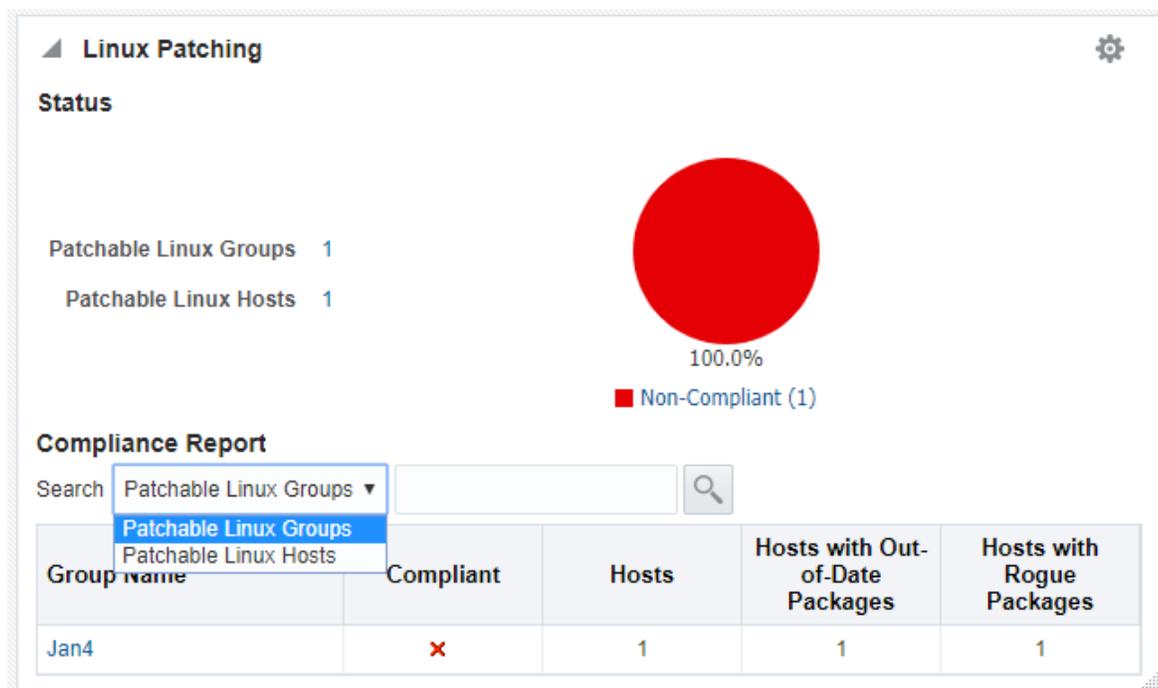


Figure 16. Oracle Linux patching non-compliant view

Ksplice for Oracle Linux

Ksplice updates the Oracle Linux operating system kernel and key user space libraries, whilst the operating system is running, without a reboot or interruption. To enable Oracle Enterprise Manager's Ksplice management capability, all Oracle Linux Hosts must have an Oracle Enterprise Manager agent installed and configured with Ksplice software. For further details, refer to Ref 4 and Ref 5.

Ksplice configuration metrics are collected on every monitored Oracle Linux Host configured with Ksplice software (Uptrack v1.2.45 or Enhanced Ksplice v1.0.29 or higher). To access these metrics: From the Host menu on a host's home page, select Configuration > Latest:

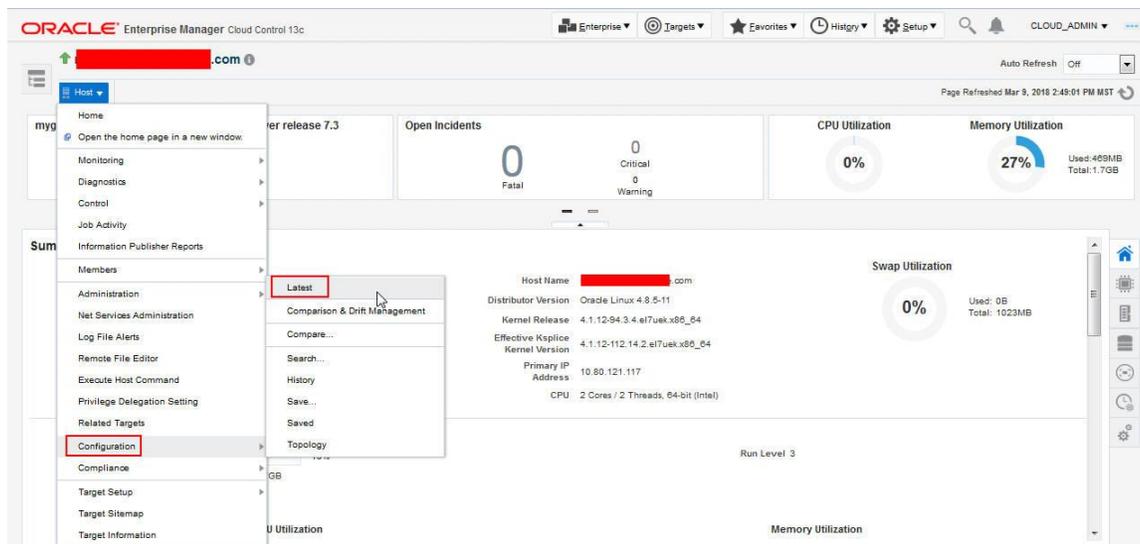


Figure 17. Oracle Linux Host > Configuration > Latest

This view is for an offline Ksplice host, which is up to date for the kernel but out of date for user space:

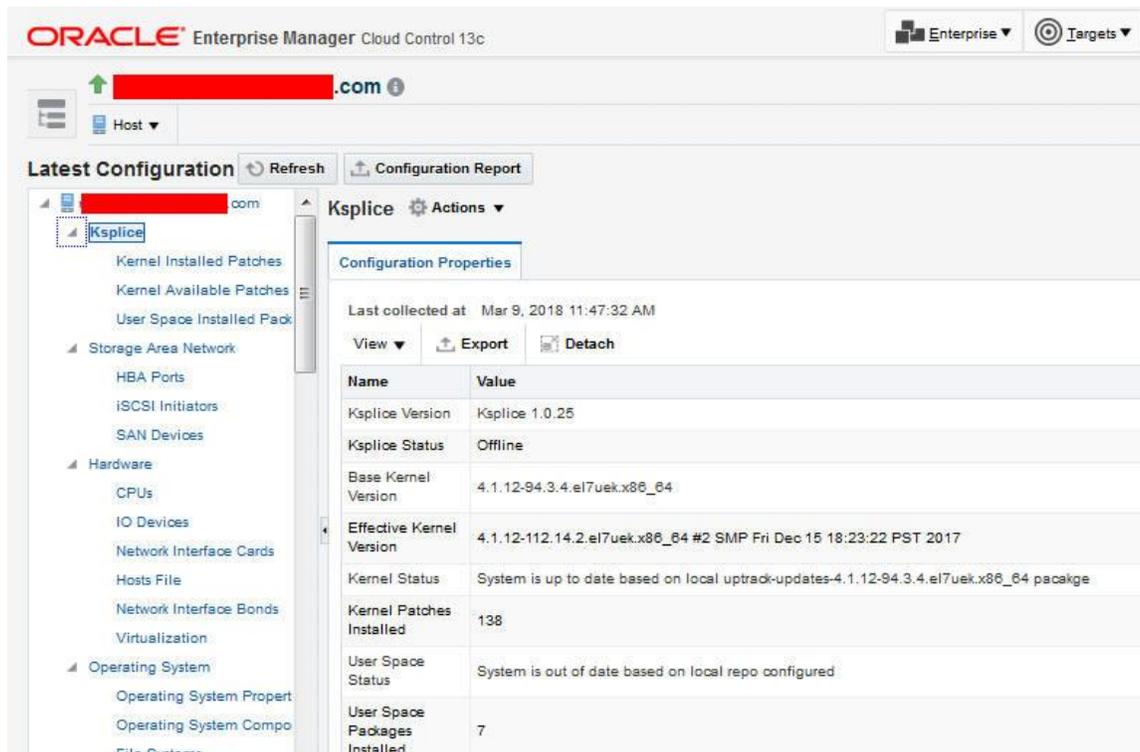


Figure 18. Oracle Linux Host Ksplice offline

This view is for an online Ksplice host, which is up to date for the kernel but out of date for user space:

The screenshot shows the Oracle Enterprise Manager Cloud Control 13c interface. The top navigation bar includes the Oracle logo and 'Enterprise Manager Cloud Control 13c'. Below this, there's a breadcrumb trail showing the host name. The main content area is titled 'Ksplice' and includes a 'Configuration Properties' section. This section shows the following data:

| Name | Value |
|-------------------------------|--|
| Ksplice Version | Ksplice 1.0.25 |
| Ksplice Status | Online |
| Base Kernel Version | 3.8.13-118.17.5.el7uek.x86_64 |
| Effective Kernel Version | 3.8.13-118.20.1.el7uek.x86_64 #2 SMP Thu Dec 7 08:20:41 PST 2017 |
| Kernel Status | System is up to date |
| Kernel Patches Installed | 60 |
| User Space Status | System is out of date |
| User Space Packages Installed | 8 |

Figure 19. Oracle Linux Host Ksplice online

The following metrics are collected:

- **Ksplice Version**
This reports the version of the Ksplice software installed on the Target Host.
- **Ksplice Status**
This reports if the host is configured to receive updates from the Ksplice Server or if it is Ksplice offline.
- **Base Kernel Version**
This queries the stock (base) kernel running in the system; this version does not represent the patched version, only the one that booted the system.
- **Effective Kernel Version**
This reports the Effective Kernel, which means the kernel version after the live Ksplice patching including security and other fixes. This also reports the last applied patch date.
- **Kernel Status**
This reports if the kernel of the host is up to or out of date. A system is up to date if it has all available Ksplice patches installed.
- **Kernel Patches Installed**
This reports the count of Ksplice packages installed on the system.
- **User Space Status**
This reports if the host's user space Ksplice-aware packages are up to or out of date. If this in an offline Ksplice host, the status is based upon the local repositories configured on the system.

- User Space Packages Installed
This reports the count of Ksplice user space packages installed on the system.
- Kernel Installed Patches
This reports the installed Ksplice patches in the system.
- Kernel Available Patches
This lists the available Ksplice patches for the kernel. In essence, it lists the patches that have not yet been installed. This information is gathered based on the Ksplice configuration. In the case of an online Ksplice host configured with Ksplice server, ULN is the information source.

In the case of an offline Ksplice host, it reflects the data based on the `uptrack-updates-`uname -r`` package installed on the system.
- User Space Installed Packages
This reports the Ksplice user space packages installed on the system.

The Ksplice Patching Region on the Oracle Linux Home Page uses the metrics collected, detailed earlier, to collate the Ksplice status over all the Ksplice-enabled Oracle Linux hosts monitored; it contains two sub-regions:

- Ksplice Status Region
This region shows the total number of Ksplice-enabled hosts; clicking on that number will open a list of hosts.

The Ksplice Status Region contains two pie charts:

Kernel Status

User Space Status

Each pie chart shows the status of all hosts, including how many are compliant, non-compliant or compliance unknown. Clicking on a particular compliance status will open another page with associated hosts.

- Ksplice Summary Region
This region shows Ksplice enabled hosts:
Ksplice Status (Online/Offline)
Kernel Status (Compliant/Non-Compliant/Compliance unknown)
User Space Status (Compliant/Non-Compliant/Compliance unknown)
Effective Kernel Version

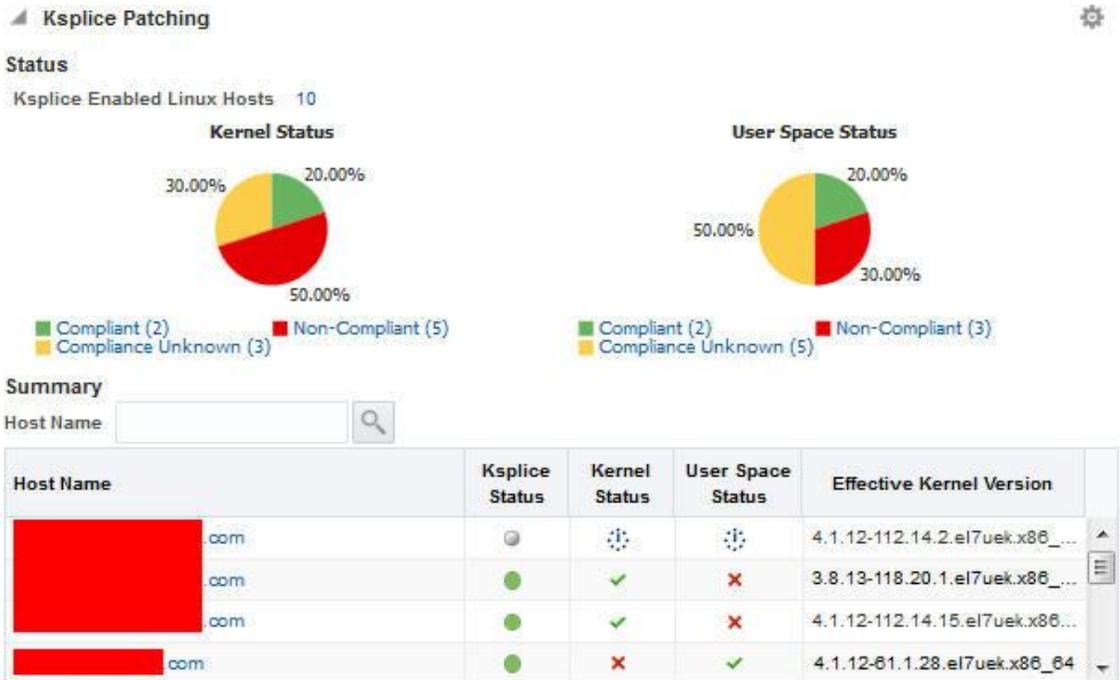


Figure 20. Oracle Linux Host Ksplice region

By clicking on the number next to Ksplice Enabled Hosts (in Figure 20 above “10”), this leads to the Ksplice Linux Hosts page, which contains a table displaying the following:

- Ksplice Enabled Hosts with Ksplice software
- Ksplice software Version
- Ksplice Status (Online – Green / Offline - Grey)
- Kernel Status (Compliant/Non-Compliant/Compliance unknown-in case of unconfigured/offline systems)
- Number of Kernel Installed Patches
- User Space Status (Compliant/Non-Compliant/Compliance unknown - in case of unconfigured/offline systems)
- Number of User Space Installed Patches
- Base Kernel Version
- Effective Kernel Version

| Host Name | Version | Ksplice Status | Kernel Status | Installed Patches | User Space Status | User Space Installed Patches | Base Kernel Version | Effective Kernel Version |
|----------------|----------------|----------------|---------------|-------------------|-------------------|------------------------------|--------------------------------|---|
| [REDACTED].com | Ksplice 1.0.25 | ● | ⌚⌚ | 138 | ⌚⌚ | 7 | 4.1.12-94.3.4.el7uek.x86_64 | 4.1.12-112.14.2.el7uek.x86_64 #2 SMP Fri Dec 15 18:23:22 PST 2017 |
| [REDACTED].com | Ksplice 1.0.25 | ● | ✓ | 60 | ✗ | 8 | 3.8.13-118.20.1.el7uek.x86_64 | 3.8.13-118.20.1.el7uek.x86_64 #2 SMP Thu Dec 7 09:20:41 PST 2017 |
| [REDACTED].com | Ksplice 1.0.25 | ● | ✓ | 0 | ✗ | 0 | 4.1.12-112.14.15.el7uek.x86_64 | 4.1.12-112.14.15.el7uek.x86_64 #2 SMP Thu Feb 9 09:58:19 PST 2018 |
| [REDACTED].com | Ksplice 1.0.29 | ● | ✗ | 41 | ✓ | 6 | 4.1.12-01.1.18.el7uek.x86_64 | 4.1.12-01.1.28.el7uek.x86_64 #2 SMP Thu Feb 23 19:55:12 PST 2017 |
| [REDACTED].com | Ksplice 1.0.29 | ● | ✗ | 287 | ✗ | 0 | 4.1.12-01.1.18.el7uek.x86_64 | 4.1.12-01.1.28.el7uek.x86_64 #2 SMP Thu Feb 23 19:55:12 PST 2017 |
| [REDACTED].com | 1.2.47 | ● | ✗ | 292 | ⌚⌚ | | 4.1.12-01.1.18.el7uek.x86_64 | 4.1.12-01.1.28.el7uek.x86_64 #2 SMP Thu Feb 23 19:55:12 PST 2017 |
| [REDACTED].com | 1.2.47 | ● | ✗ | 293 | ⌚⌚ | | 4.1.12-01.1.18.el7uek.x86_64 | 4.1.12-01.1.28.el7uek.x86_64 #2 SMP Thu Feb 23 19:55:12 PST 2017 |

Figure 21. Ksplice Enabled Oracle Linux Hosts

In Figure 21, the last two hosts have a version of 1.2.47. This denotes that the Ksplice Enhanced client is not installed (uptrack client) and therefore no user space patches are listed.

By clicking on a host name in the Ksplice detail table, a new page will be opened. This page will list the installed Ksplice patches on that host. If this host is a Ksplice Online host, it will also list what updates are available; these updates can be added or removed from this page.

If the host is a Ksplice offline host, this page will show all the Ksplice kernel or user space patches available in the local repository. If the Ksplice enhanced client software is installed on the host, then it will display a list of installed or available user space patches, otherwise, it will show "Install/Upgrade/Configure Ksplice Enhanced Client Software". With a Ksplice offline host, the Ksplice status will be a grey rather than a green dot, which denotes an online host. In addition, with an offline host, two dotted clocks are present for the kernel and user space status as the latest updates can only be determined from the offline repository, which may not be the latest from ULN.

Notice the refresh button; this refreshes the latest data to the dashboard. When clicked, there will be a dialogue box, which will take confirmation from user to refresh data.

For any install or remove update, root privilege or credentials have to be selected and entered. The use of the uptrack or the enhanced client features is available. Best practice is to install all updates; therefore, we follow this model even for the uptrack client to keep the deployment model consistent. The removal of updates for the kernel is possible by ID / individually, however for user space it is only possible to remove all updates.

| Key | Description |
|-----------|--|
| r6u3kteu | Buffer memory leaks in Multiple Devices (MD) persistent data dr... |
| lge98lhz | CVE-2016-8962: Privilege escalation when detaching SCSI dri... |
| j1hm2ptk | CVE-2016-10044: Permission bypass when setting up an asyn... |
| cdffgn8 | CVE-2016-10088: Use-after-free in SCSI device interface. |
| goidfth | CVE-2016-10147: Specifying incompatible cryptographic algori... |
| 3ep08nqk | CVE-2016-10200: Denial-of-service when creating L2TP sockets... |
| jzc8089s | CVE-2016-10208: Denial-of-service when mounting ext4 image... |
| m94wz23 | CVE-2016-10229: Remote code execution when receiving UDP... |
| k8s3htzu | CVE-2016-10318: Denial of service in filesystem encryption pol... |
| tqy551n | CVE-2016-1237: Permission bypass in NFS filesystem when sett... |
| p2px0kzdz | CVE-2016-2187: Denial of service in GTCO CallComp/InterWrit... |

| Key | Description |
|-----------|--|
| ql6ats70 | CVE-2015-8956: NULL pointer dereference in the Bluetooth sta... |
| cd8k5xzs | CVE-2016-2053: Denial of service in ASN.1 BER decoding. |
| z0u28at4 | CVE-2016-3070: Denial of service when migrating dirty pages. |
| 10s8mq0 | CVE-2016-3140: Denial of service in Digi AcoolePort USB descr... |
| ok0778nk | CVE-2016-4482: Information leak in USB devfs ioctl. |
| lm8s3z3g | CVE-2016-4578, CVE-2016-4589: Information leak in sound tl... |
| 1uoc3wg0 | CVE-2016-4794: Use-after-free in per-cpu memory allocator. |
| x81w125 | CVE-2016-6136: Audit log message spoofing. |
| 9lgtmempa | CVE-2016-6480: Denial-of-service in Adaptec AACRAID driver. |
| qx200gy | CVE-2016-6828: Use after free during TCP transmission. |
| vt5s30wo | CVE-2016-7042: Stack corruption when reading keys from proc f... |

Figure 22. Ksplice Host Kernel

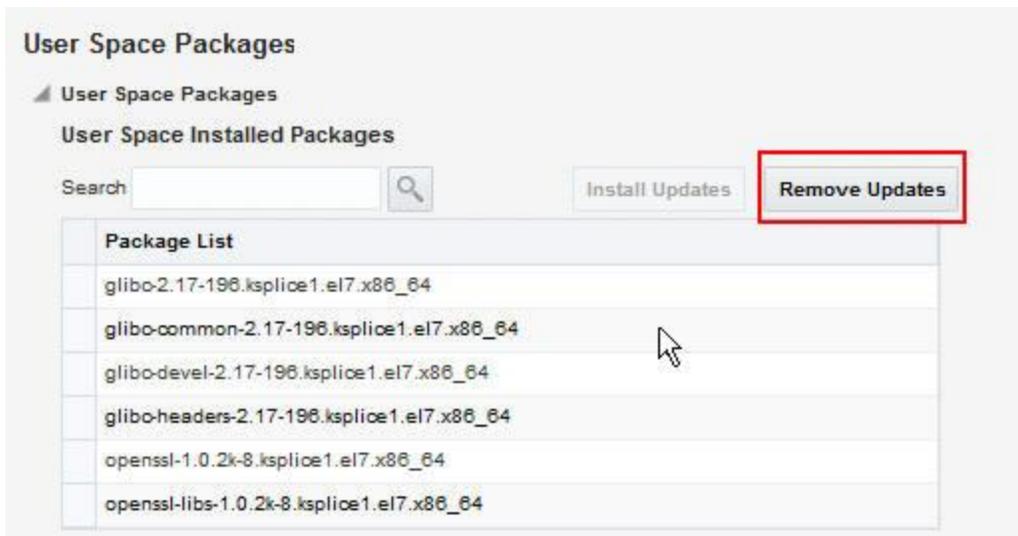


Figure 23. Ksplice Host User Space

Oracle Linux Patching

Oracle Enterprise Manager 13c provides the following Linux patching features:

- Set up Linux RPM repositories based on ULN channels
- Download advisories (errata) from ULN
- Set up a Linux patching group to update a group of Linux hosts and collect compliance information
- Allow non-compliant packages to be patched
- Roll back last update/uninstall packages from host
- Manage RPM repositories and channels (clone channels, copy packages from one channel into another, delete channels)
- Add RPMs to custom channels
- Manage configuration file channels (create/delete channels, upload files, copy files from one channel into another)
- Run pre- and post-patching scripts
- Linux Patching Admin and Operator role-based access

From Oracle Enterprise Manager 13c version 13.4 Release Update 4 Oracle Linux version 8 is supported for Oracle Linux patching; at this time, application stream module patching is not supported.

The patching framework is accessed from either the Oracle Enterprise Manager or Oracle Linux Home menu:

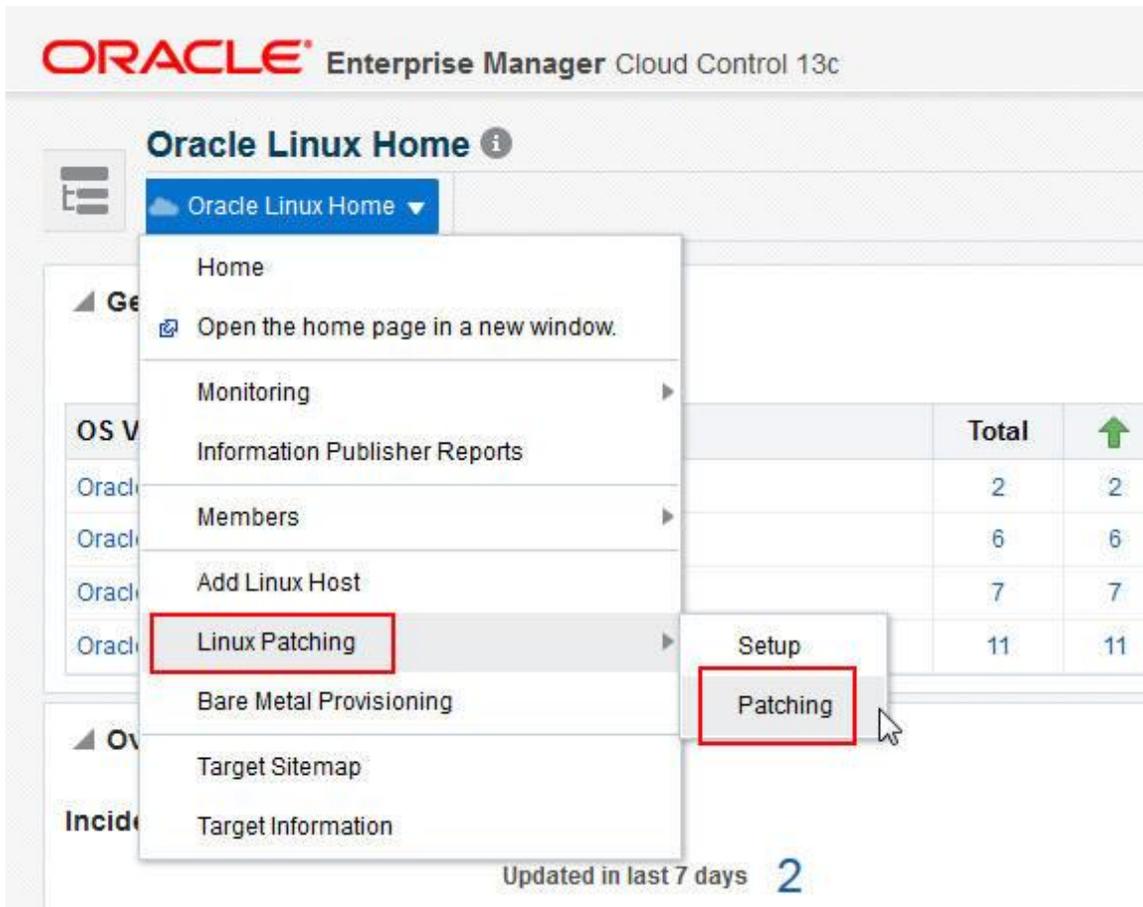


Figure 24. Linux Patching via Oracle Linux Home

From here, it is possible to set up and use the Linux patching framework.

Oracle Enterprise Manager allows the system administrator to create RPM repositories (repo) but also use existing repositories. This enables the administrator to easily mirror repositories from ULN and use them to patch the Linux servers.



Figure 25. Linux patching setup

Existing RPM repositories can be defined in Oracle Enterprise Manager as part of the patching setup. Administrators can create their own channels (custom channels) made of specific packages, at a specific patch level using the `createrepo/yum-arch` commands, and then register these custom repositories in Oracle Enterprise Manager.

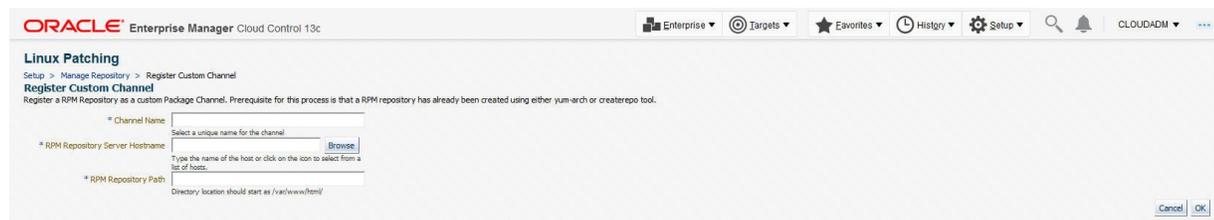


Figure 26. Manage RPM repositories

For more information on how to manually create mirrors of ULN channels, see Ref 3.

From the Manage RPM Repository section, existing channels can be cloned using the Create-Like feature. The Copy Packages feature allows packages to be copied from one channel to another.

Target servers can be organized in groups that are associated to channels, and periodic scans for updates will be made on the servers of these groups. Managing groups of servers associated with custom channels is an effective way to enforce system image standards. Depending on the purpose of the servers, a set of packages has to be installed and kept up to date on the servers. The administrator creates channels for each group of servers with only the packages that the servers from a particular group need. For example, the database servers with Oracle Database 12c running on Oracle Linux 6 could belong to the group “OL6Host_DB12” with an associated custom channel containing the packages for the installation and execution of Oracle Database. This method helps the administrator maintain a standard in the data center and improves security. In the event the server requires an additional package to be installed, the system administrator would add the package to the custom channel.

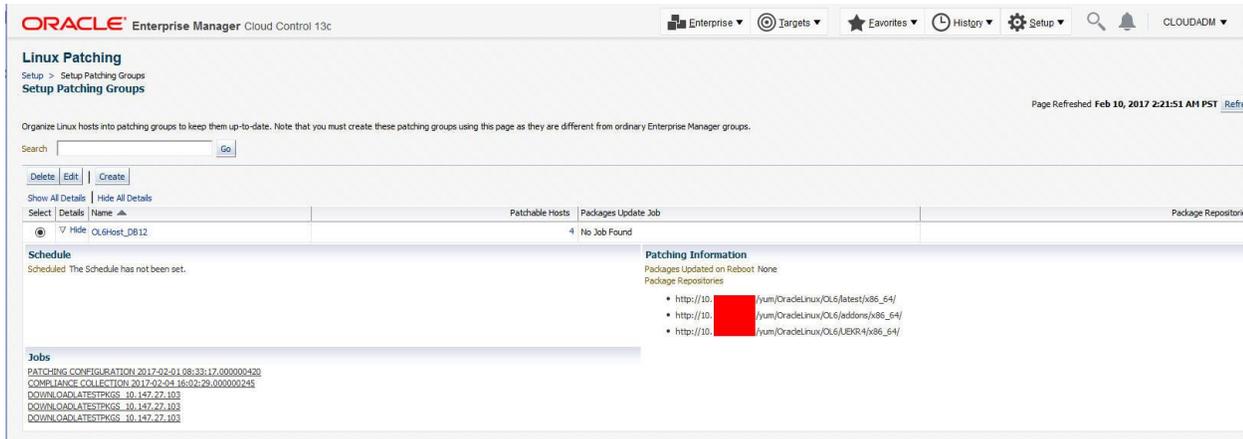


Figure 27. Set up patching groups

Once the patching setup is complete, the administrator can select Linux Patching via the Oracle Linux Home target page. Following initialization, it is possible to determine the level of compliance of the systems.

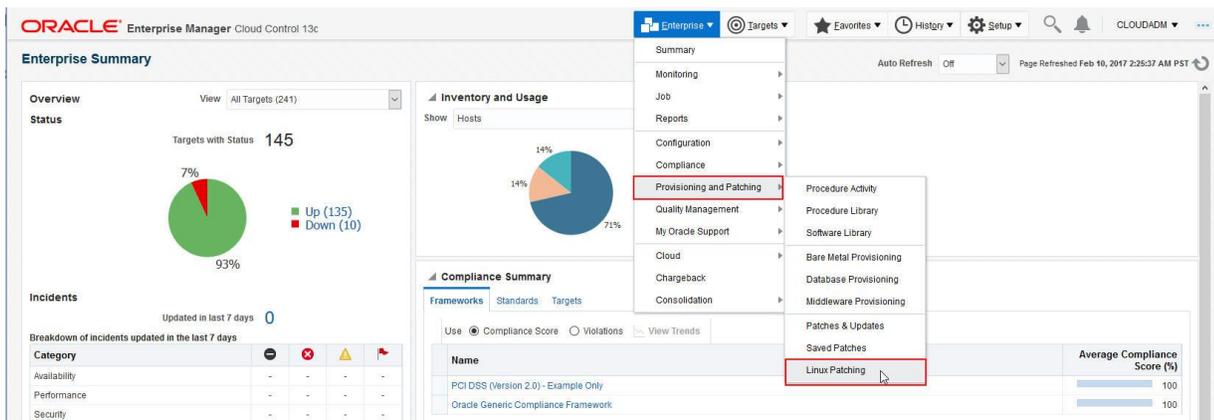


Figure 28. Linux patching

The Compliance Home section provides the administrator with status reports showing which systems need updates. From here, patching can be scheduled and rolled back per patching group. During this process, it is possible to run pre-scripts and post-scripts.

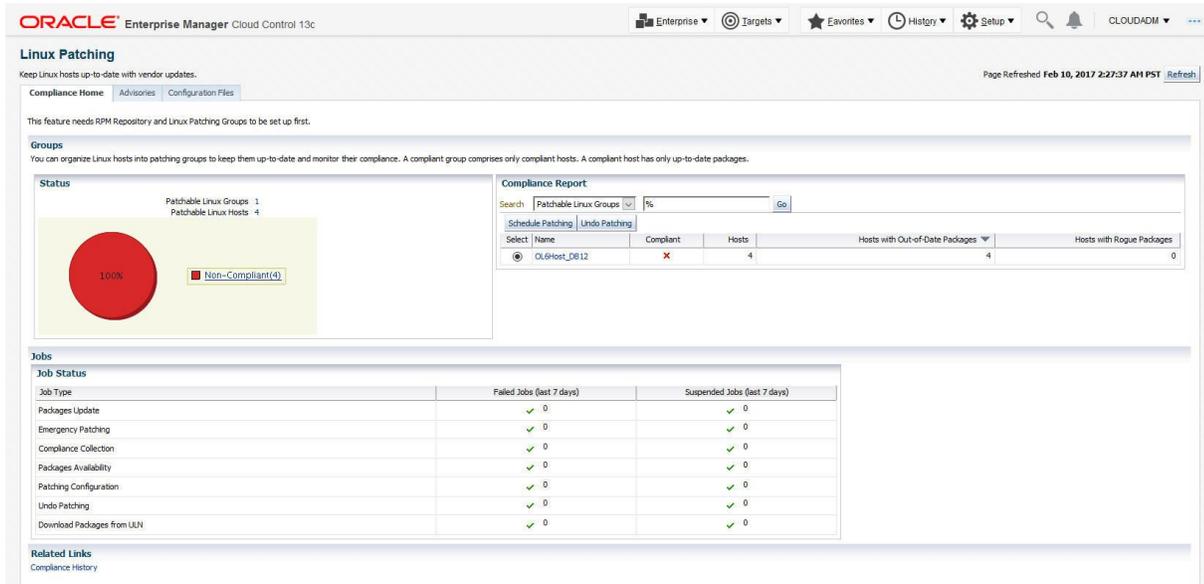


Figure 29. Linux patching compliance home section

Advisories indicate how critical the various available updates are.

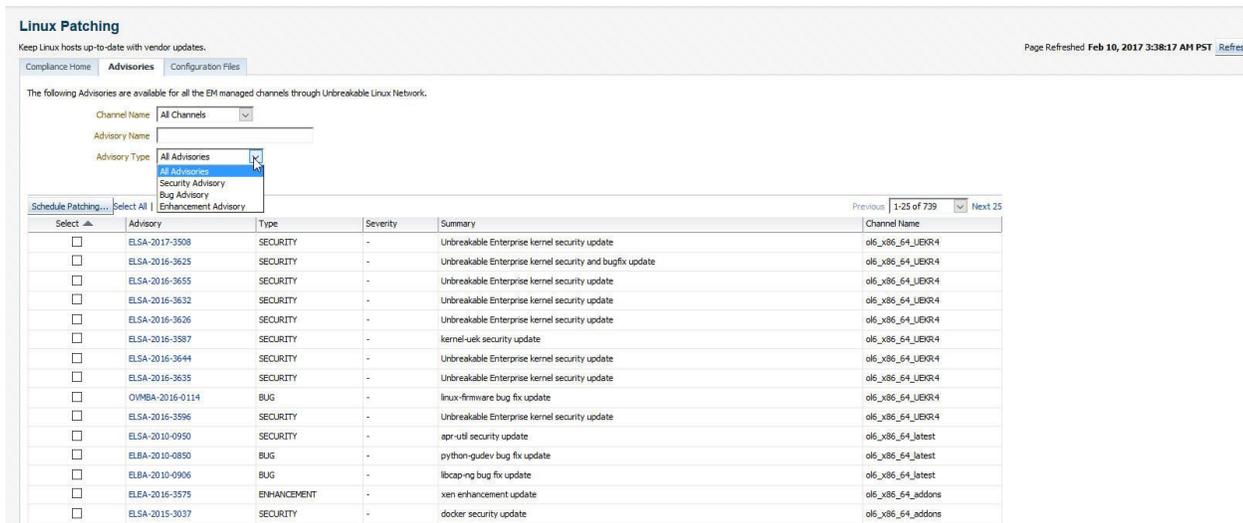


Figure 30. ULN advisories

Reporting

Use the reporting features of Oracle Enterprise Manager to run the following Linux patching reports:

- Non-compliant packages for all hosts
- Non-compliant packages for a single host
- Compliance information for all patchable Linux groups
- Compliance information for all patchable Linux hosts

| | | | |
|-----------------------|-----------------------------------|---|--------|
| <input type="radio"/> | Linux Operating System Patching | | |
| <input type="radio"/> | Non-Compliant Packages | Displays out-of-date and rogue packages across all hosts. | SYSTEM |
| <input type="radio"/> | Non-Compliant Packages (Host) | Displays out-of-date and rogue packages on a host. | SYSTEM |
| <input type="radio"/> | Patchable Linux Groups Compliance | Displays compliance information for all Patchable Linux Groups. | SYSTEM |
| <input type="radio"/> | Patchable Linux Hosts Compliance | Displays compliance information for all Patchable Linux Hosts. | SYSTEM |

Figure 31. Linux patching reports

Configuration files

Configuration file channels can be created by the system administrator to enforce the compliance of the general configuration of systems. For example, general or explicit network configuration files can be deployed to single or multiple host targets with the option to run pre- and post-scripts.



Figure 32. Configuration file channels

Provisioning

Oracle Enterprise Manager 13c allows the administrator to provision Oracle Linux on bare metal servers. From Oracle Enterprise Manager 13c version 13.4 Release Update 4 Oracle Linux version 8 is supported for provisioning. While virtual machines can also be provisioned, that is out of the scope of this paper. The provisioning framework is accessed from either the Oracle Enterprise Manager or Oracle Linux Home menu:

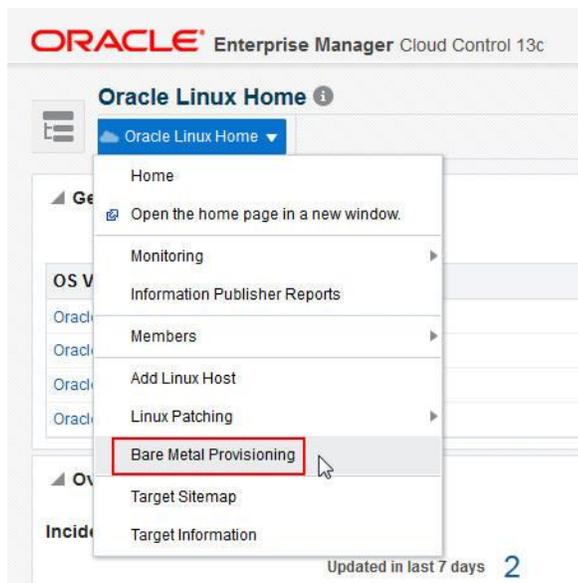


Figure 33. Linux Provisioning via Oracle Linux Home

The method used to provision Linux on the bare metal server is standard PXE, HTTP, Kickstart and the use of RPM repositories. The provisioning infrastructure includes a stage server where the server's installation files are staged, a DHCP server from which the server will get the network information and a boot server where TFTP boot is configured.

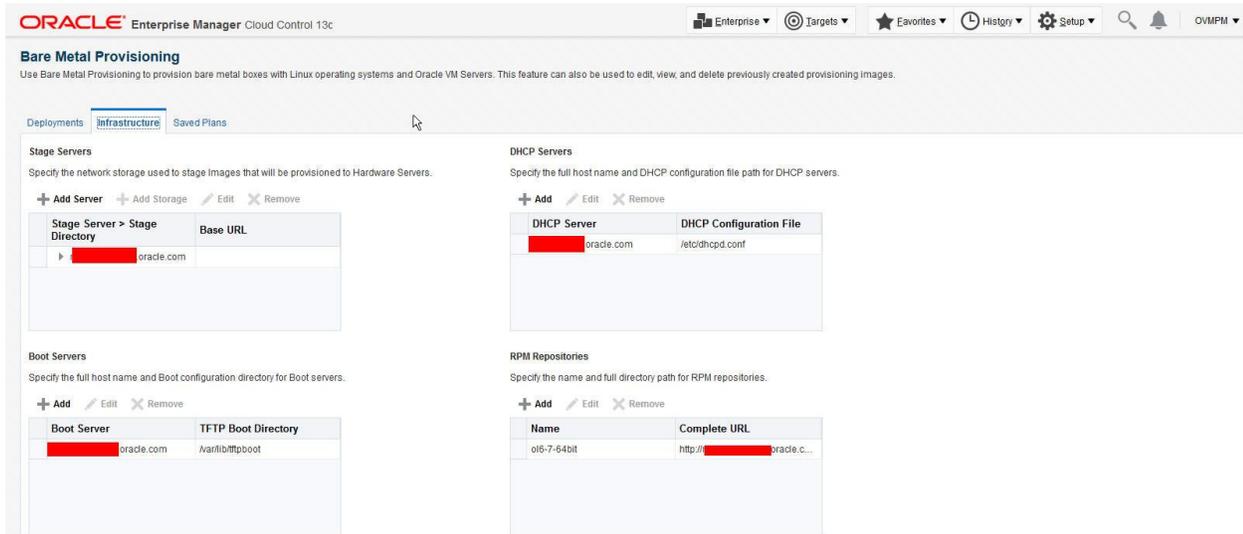


Figure 34. Bare metal provisioning infrastructure

In the Deployment tab, bare metal provisioning images can be added and viewed.

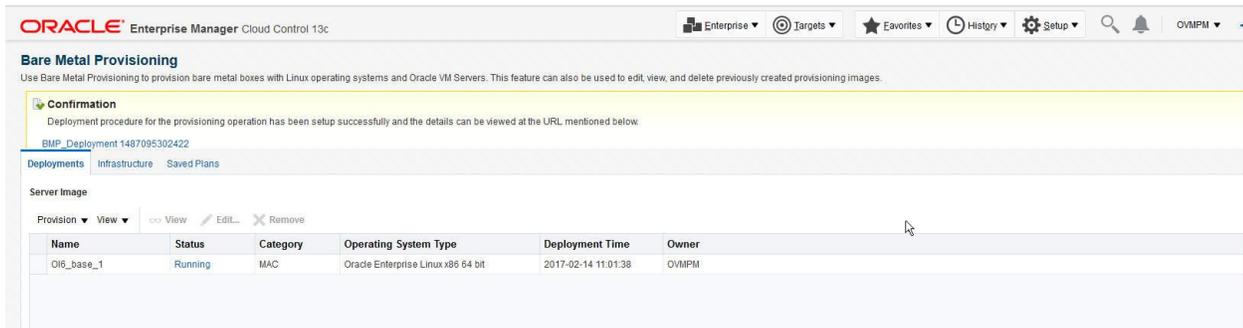


Figure 35. Bare metal provisioning images

The images consist of a set of information, for example, the server MAC address and the Linux installation details used to create the Kickstart file. The following screenshots (Figure 36 through to Figure 40), show how to configure a bare metal provisioning image. As part of the bare metal provisioning flow, it is also possible to deploy and configure the Oracle Enterprise Manager agent.

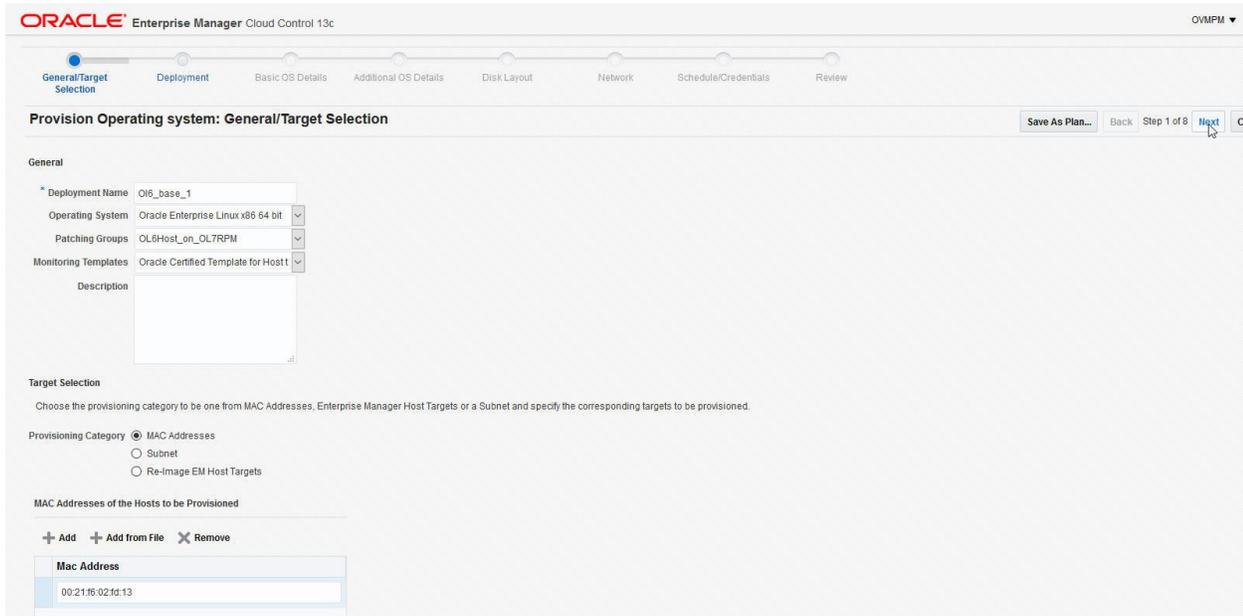


Figure 36. Bare metal provisioning image creation (1 of 5)

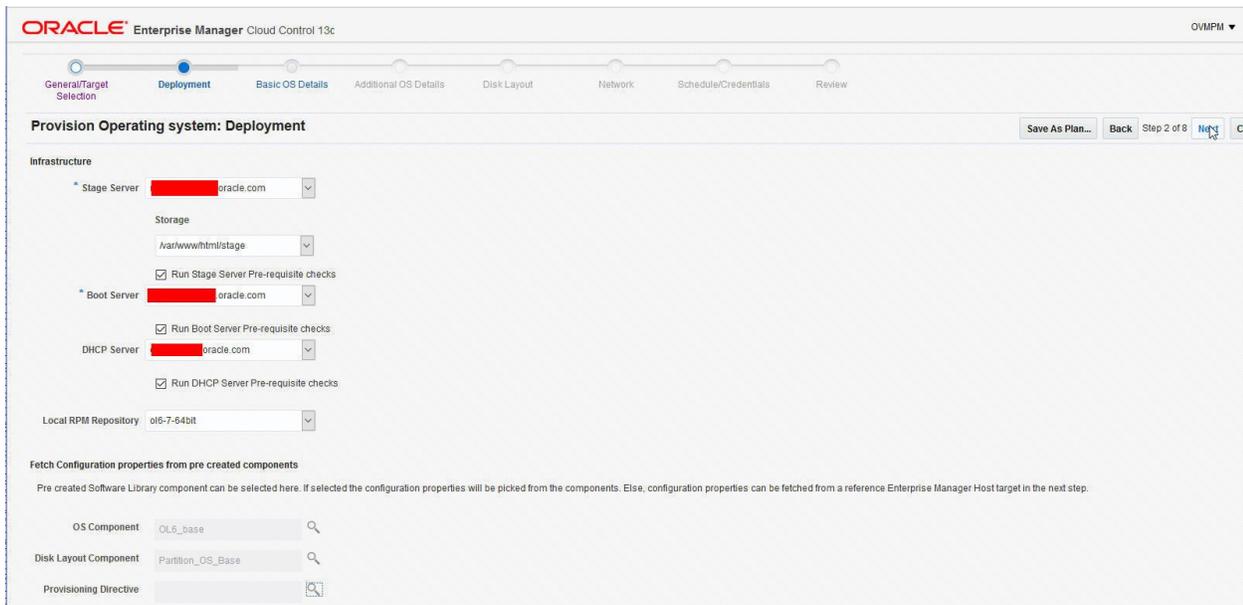


Figure 37. Bare metal provisioning image creation (2 of 5)

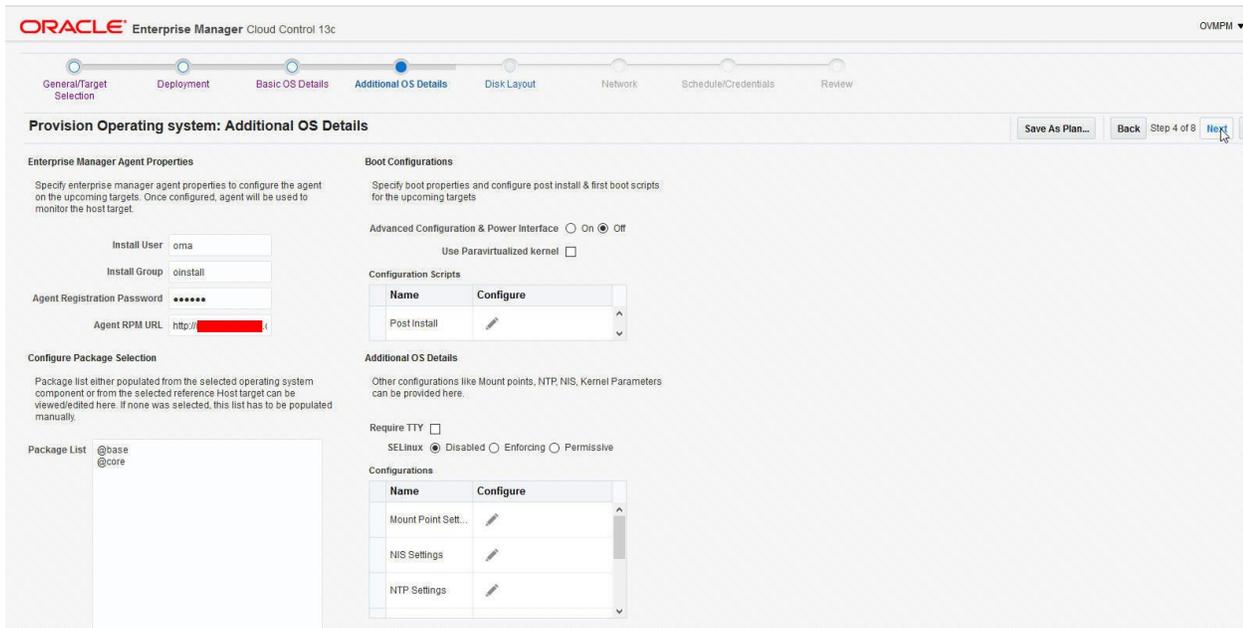


Figure 38. Bare metal provisioning image creation (3 of 5)

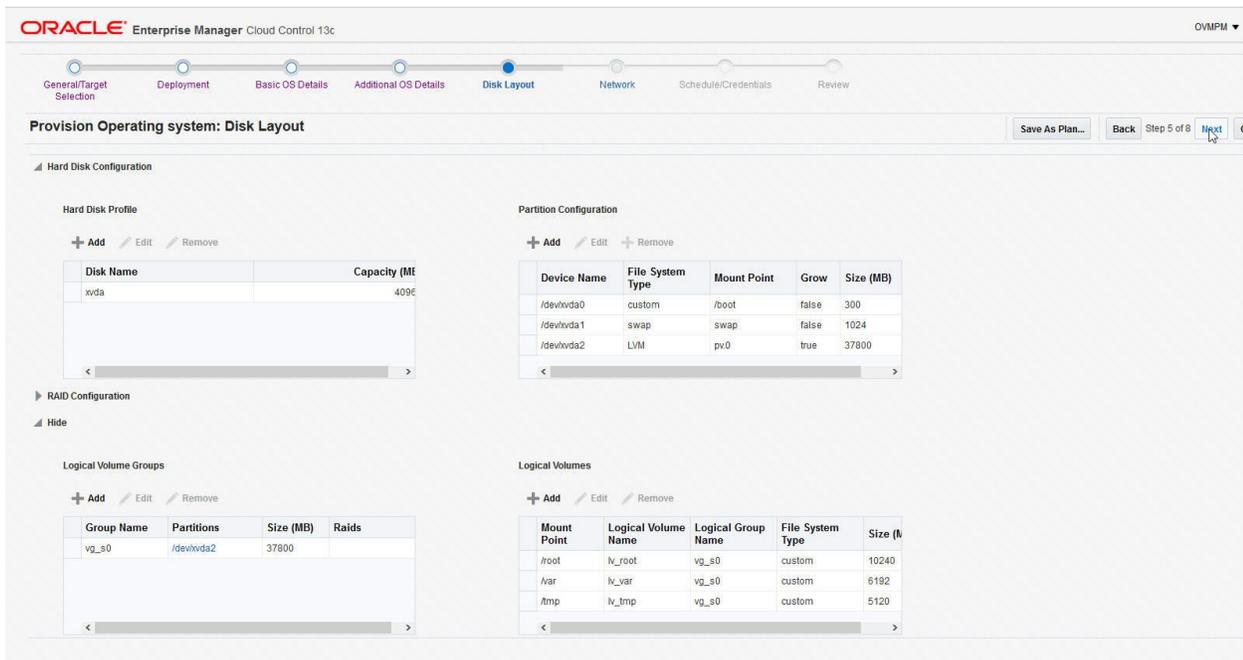


Figure 39. Bare metal provisioning image creation (4 of 5)

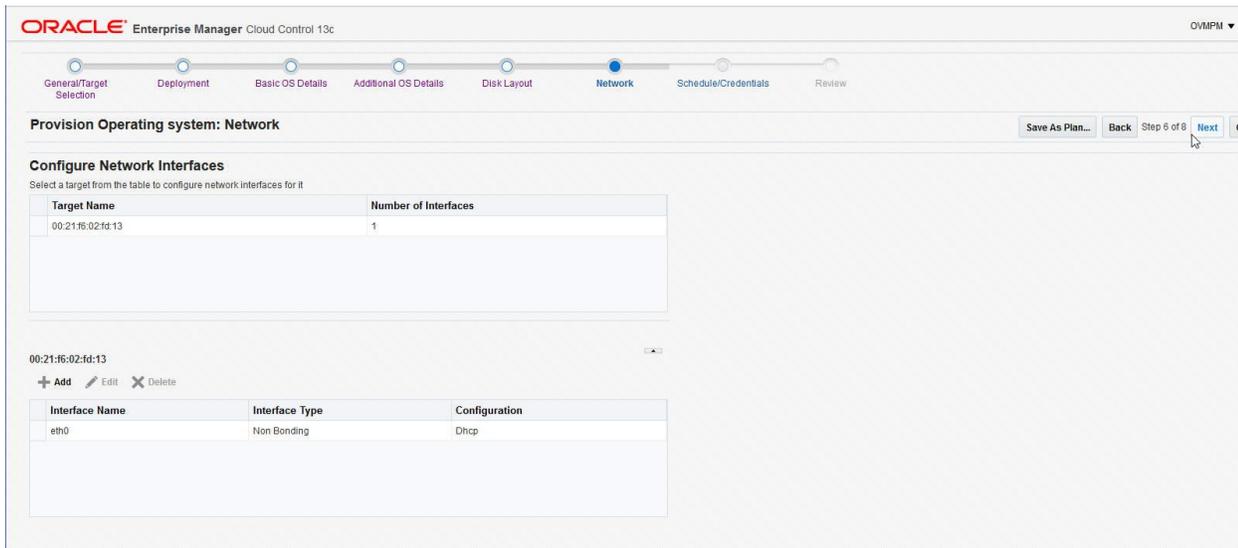


Figure 40. Bare metal provisioning image creation (5 of 5)

Monitoring

Oracle Enterprise Manager 13c provides an incident / event framework that the administrator can use to quickly determine any incident or abnormal activity within the data center.

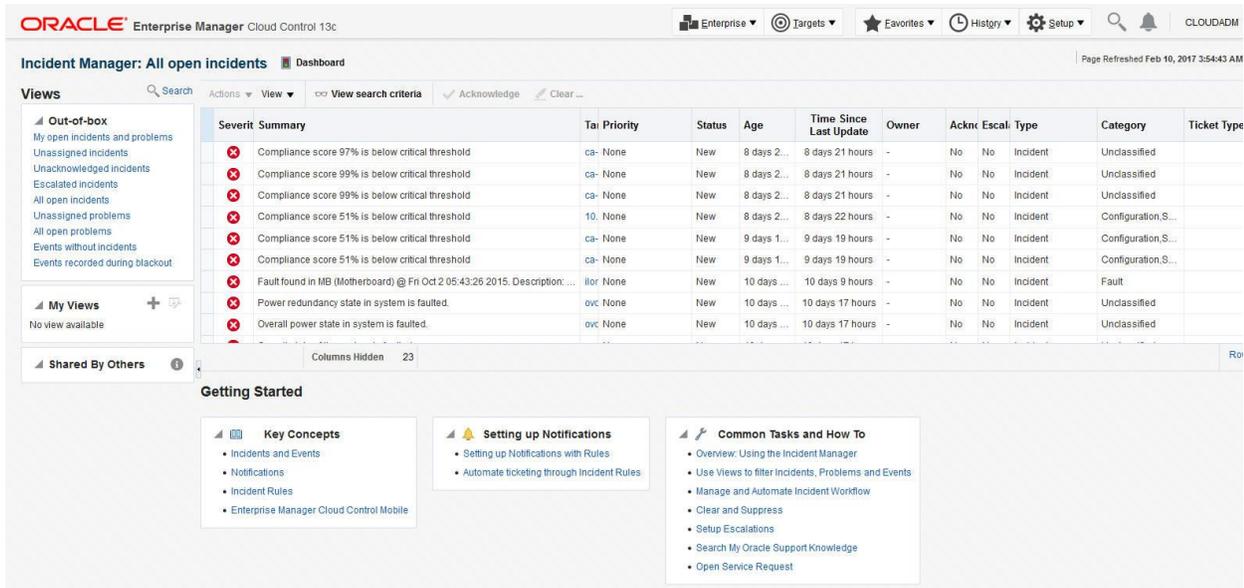


Figure 41. Incident manager

In addition, the per-server view provides more detail about a particular host.

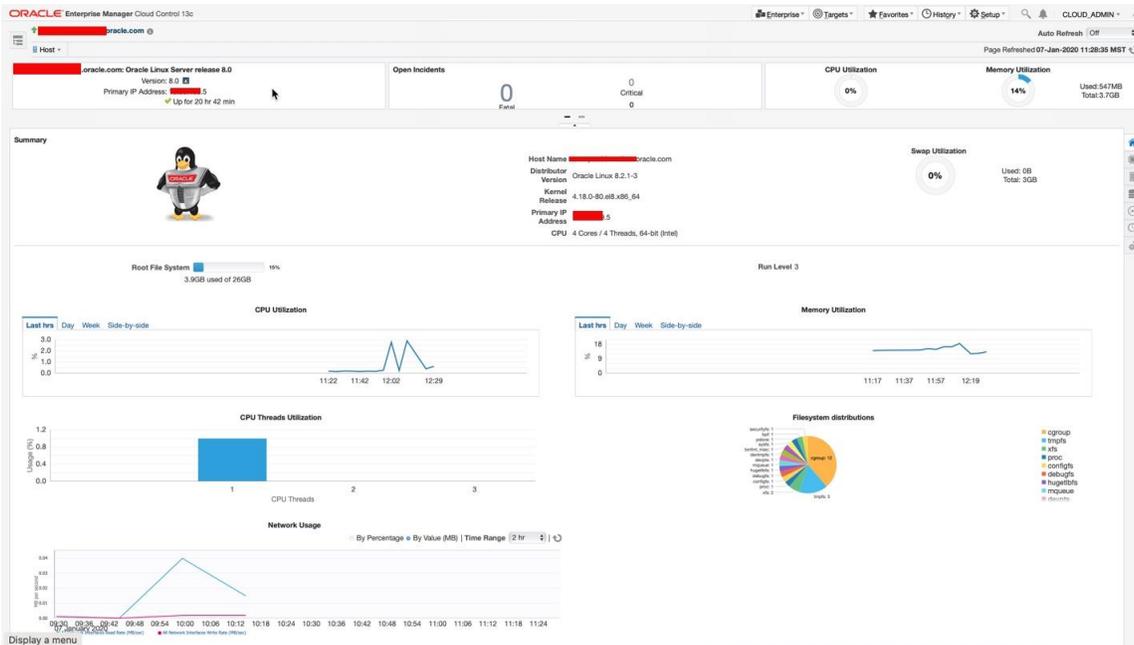


Figure 42. Host target summary screen

Administration

Oracle Enterprise Manager 13c provides administration features for the following areas accessed via the Host target home page > Administration menu:

- Linux Services
- System Run Levels
- Network Cards
- Hosts Lookup Tables
- NFS Client
- User and Group

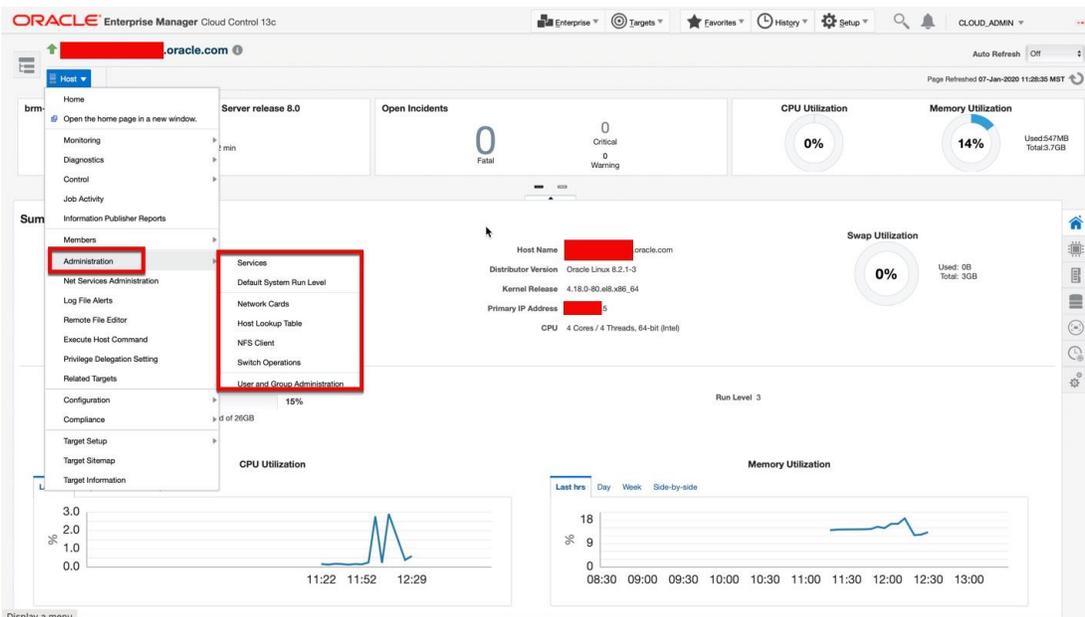


Figure 43. Administration features

From Oracle Enterprise Manager 13c version 13.3 support for these administration features is for Oracle Linux 6 (OL6) and Oracle Linux 7 (OL7) hosts. From Oracle Enterprise Manager 13c version 13.4 Release Update 4 Oracle Linux version 8 hosts are supported. Before these releases, support is dependent upon the installation of required packages referenced from the advisory notification in Figure 44 below. See Ref 2 for the Oracle Linux 6 (OL6) based packages. Note: Before Oracle Enterprise Manager 13c version 13.3 support is for Oracle Linux 6 (OL6) only.

Required Installations

To administer a host through Enterprise Manager, you will need to install the following scripts. Follow the steps below and click 'Finish' button when you are done.

Step 1 Install YAST and EM Wrapper Scripts from <http://oss.oracle.com/projects/yast>

Figure 44. Host advisory notification advisory

Operational procedures

Oracle Enterprise Manager 13c provides a library of procedures tailored for specific tasks such as provisioning and patching a database. Administrators can create their own procedures in a shell script or Perl to automate certain operational tasks.

| Select | Procedure | Type | Parent | Version | Last Updated | Description | Last Modified By | Owner |
|----------------------------------|--|----------------------------------|--------|---------|-----------------------------|--|------------------|--------|
| <input checked="" type="radio"/> | Provision Oracle Database | Oracle Database Provisioning | None | 20.1 | Jan 19, 2017 9:41:21 AM UTC | This procedure provisions the Oracle Grid Infrastructure for Standalone Server and Oracle Single Instance Database on the selected hosts. | Oracle | Oracle |
| <input type="radio"/> | Patch Oracle Restart (12.1.0.1.0 onwards) | Patch Oracle Software | None | 13.21 | Jan 19, 2017 9:41:15 AM UTC | Procedure for patching Oracle Restart installations. It supports patching of 12.1 targets with Reboot patches and patches the Database home first and then the Restart home. Note: Major upgrades, such as from Oracle Database 10.1 to 10.2, are not supported. | Oracle | Oracle |
| <input type="radio"/> | Provision Oracle RAC Database | Oracle RAC Database Provisioning | None | 20.1 | Jan 19, 2017 9:41:10 AM UTC | This procedure provisions Oracle Grid Infrastructure and Oracle Real Application Clusters for clustered environments for versions 11g Release 2 and higher. | Oracle | Oracle |
| <input type="radio"/> | Patch Oracle Restart | Patch Oracle Software | None | 13.21 | Jan 19, 2017 9:41:03 AM UTC | Procedure for patching Oracle Restart installations with Critical Patch Updates and interim patches. Applicable for version 11.2.0.1.0 and higher. Note: Patchsets are not supported. | Oracle | Oracle |
| <input type="radio"/> | Data Masking for Fusion SaaS PDD | Oracle Database Provisioning | None | 1.0 | Jan 19, 2017 9:40:36 AM UTC | Data Masking deployment procedure to run ADM Verify, Generate Masking Script and Run Masking Script against Fusion SaaS PDD Database | Oracle | Oracle |
| <input type="radio"/> | Patch Oracle RAC Database - Rolling | Patch Oracle Software | None | 13.21 | Jan 19, 2017 9:40:30 AM UTC | Procedure for patching an Oracle RAC Database in Rolling mode with Critical Patch Updates and interim patches. This procedure is not applicable for installations registered with different clusterware. This procedure does not support patching of shared Oracle Home RAC Database installations. Applicable for version 10.1, 10.2 and higher. Note: Major upgrade for example, DB 10.1 to 10.2 is not supported. | Oracle | Oracle |
| <input type="radio"/> | Patch Oracle Clusterware (12.1.0.1.0 onwards) - Rolling | Patch Oracle Software | None | 13.21 | Jan 19, 2017 9:40:25 AM UTC | Procedure for patching an Oracle Clusterware in Rolling mode. It supports patching of 12.1 targets with Reboot patches and patches the Database home first and then the Clusterware home. Note: Major upgrades, such as from Oracle Database 10.1 to 10.2, are not supported. | Oracle | Oracle |
| <input type="radio"/> | Patch Oracle RAC Database - Parallel | Patch Oracle Software | None | 13.21 | Jan 19, 2017 9:40:13 AM UTC | Procedure for patching an Oracle RAC Database (supports application of patchsets too). This procedure supports patching of shared Oracle Home RAC Database installations. All selected instances are patched in parallel. This procedure is not applicable for installations registered with different clusterware. Applicable for version 10.1, 10.2 and higher. Note: Major upgrade for example, DB 10.1 to 10.2 is not supported. | Oracle | Oracle |
| <input type="radio"/> | Patch Oracle Clusterware (12.1.0.1.0 onwards) - Parallel | Patch Oracle Software | None | 13.21 | Jan 19, 2017 9:40:02 AM UTC | Procedure for patching Oracle Clusterware in parallel mode. This procedure can be used for patching shared Oracle home Clusterware as well. It supports patching of 12.1 targets with Reboot patches and patches the Database home first and then the Clusterware home. Note: Major upgrades, such as from Oracle Database 10.1 to 10.2, are not supported. | Oracle | Oracle |
| <input type="radio"/> | Delete Oracle Grid Infrastructure Database Software | User Defined | None | 3.0 | Oct 5, 2016 8:17:50 PM UTC | This procedure deletes Oracle Grid Infrastructure/Oracle Database Software for versions 11g Release 2 and higher from given virtual Hosts. | Oracle | Oracle |
| <input type="radio"/> | Patch Oracle Cluster ASM - Rolling | Patch Oracle Software | None | 13.20 | Oct 5, 2016 8:16:55 PM UTC | Procedure for patching Oracle Cluster ASM in Rolling mode with Critical Patch Updates and interim patches. All selected instances are patched in serial. This procedure does not support patching of shared Oracle Home Cluster ASM installations. Applicable for version 10.1, 10.2 and higher but prior to 11.2. Note: Major upgrade for example, DB 10.1 to 10.2 is not supported. | Oracle | Oracle |
| <input type="radio"/> | Patch Oracle Database | Patch Oracle Software | None | 13.20 | Oct 5, 2016 8:16:55 PM UTC | Procedure for patching standalone Oracle Database installations with Critical Patch Updates, interim patches, and patchsets. Note: Major upgrade for example, DB 10.1 to 10.2 is not supported. | Oracle | Oracle |
| <input type="radio"/> | Out of Place Patching of Oracle Restart DB11 | Patch Oracle Software | None | 13.20 | Oct 5, 2016 8:16:55 PM UTC | Procedure for patching Oracle Restart DB11 installations in Out of Place mode. | Oracle | Oracle |

Figure 45. Procedure library

Configuration drift analysis

Oracle Enterprise Manager 13c allows the administrator to compare systems in detail, for example, for compliance purposes or troubleshooting. The following screenshot depicts three systems and reports the differences between them and a reference system from hardware to software configuration.

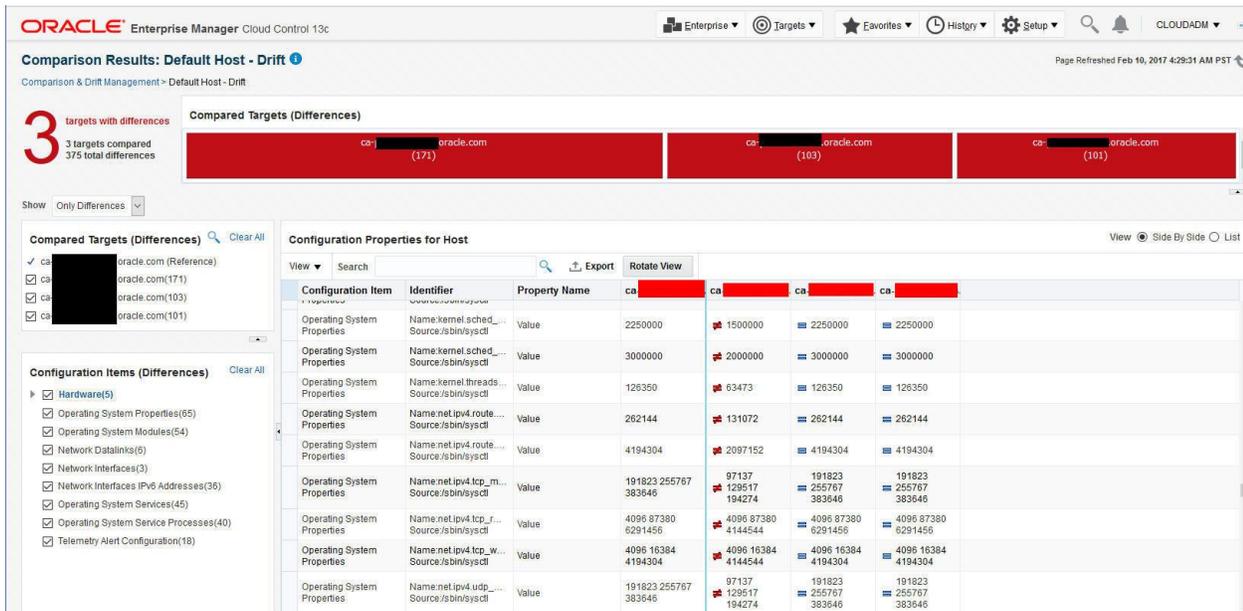


Figure 46. Configuration drift comparison

Compliance

Compliance management provides the ability to evaluate the compliance of targets and systems as they relate to business best practices for configuration, security and storage. The screenshot below depicts the Oracle Generic Compliance Framework, which provides useful information for monitoring and tracking Linux packages and settings. For example, the Compliance Framework provides advice on general security options such as open ports as well as advising of missing patches for Oracle Enterprise Manager and other Oracle products.

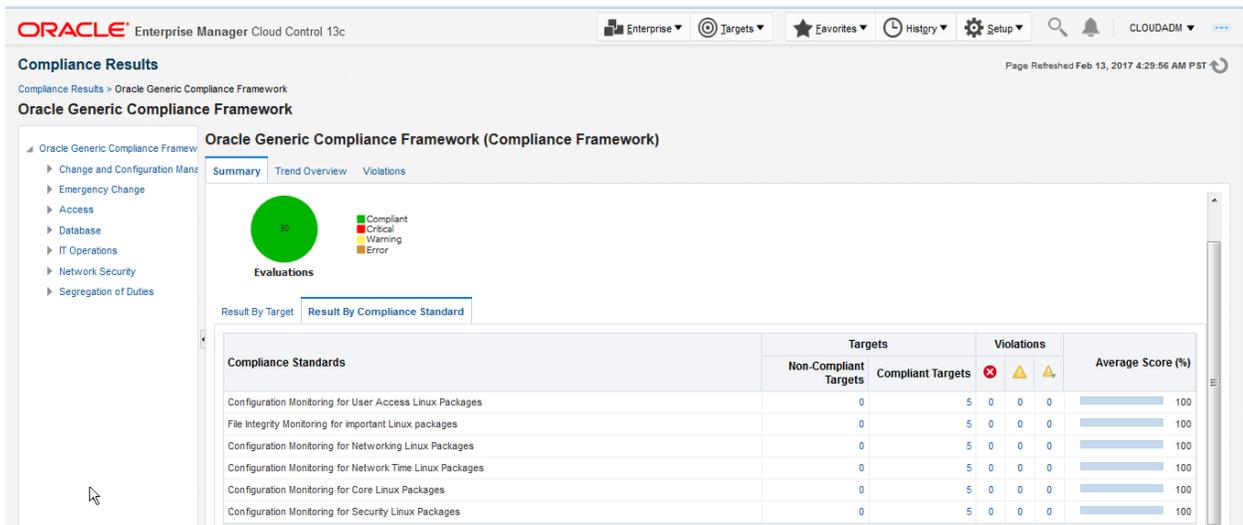


Figure 47. Oracle generic compliance framework

The lifecycle management compliance framework within Oracle Enterprise Manager 13c can also be used for real-time monitoring of files. For example, a custom compliance framework can be created to monitor critical Linux network files (/etc/hosts) and alert the user via the framework when these files were edited. Each event can be audited and referenced for future compliance tracking.

| | | | | | | | | | |
|-------------------------------|------|---------|---|------------------------|------|------------|------------------------------------|------------------|-----------|
| Server Configuration Standard | c... | OS File | Monitor my critical configuration files | Critical Network Files | root | /etc/hosts | File Content Modified (successful) | 2/1/2017 8:36 AM | Unaudited |
| Server Configuration Standard | c... | OS File | Monitor my critical configuration files | Critical Network Files | root | /etc/hosts | File Content Modified (successful) | 2/1/2017 8:30 AM | Unaudited |

Figure 48. Real-time compliance monitoring of Linux critical network files

Reporting

Reporting functionality is provided either through Business Intelligence Publisher or Information Publisher. Reports such as Host Availability, Configuration Drift, Compliance, Host Usage, Hardware Summary, Patching, OS and System Summary can be obtained through Enterprise Manager 13c.

CONCLUSION

Oracle Enterprise Manager 13c provides an integrated and cost-effective solution for complete Oracle Linux server lifecycle management. Oracle Enterprise Manager 13c delivers comprehensive provisioning, patching, monitoring, and administration capabilities via a single, web-based user interface, significantly reducing the complexity and cost associated with managing Linux operating system environments on bare metal physical machines or virtualized environments.

If the IT environment includes Oracle Database, Oracle Applications or Oracle hardware, Oracle Enterprise Manager 13c is the preferred tool to manage the Oracle Linux layer along with the complete Oracle software and hardware stack.

To learn more about Oracle Enterprise Manager, visit <https://www.oracle.com/enterprise-manager/>.

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Monitoring Oracle Linux Virtualization Manager with Oracle Enterprise Manager
July, 2020
Author: Simon Hayler

